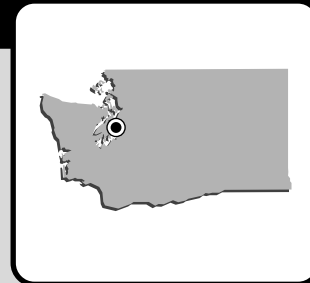


BANGOR NAVAL SUBMARINE BASE SILVERDALE, WASHINGTON

Engineering Field Division/Activity:	EFANW
Major Claimant:	CINCPACFLT
Size:	6,692 Acres
Funding to Date:	\$49,736,000
Estimated Funding to Complete:	\$50,898,000
Base Mission:	Provides support base for Trident submarines
Contaminants:	Otto fuel, picric acid, RDX, TNT



Number of Sites:		Relative Risk Ranking of Sites:		
CERCLA:	38	High:	14	Not Evaluated: 1
RCRA Corrective Action:	0	Medium:	0	Response Complete: 25
RCRA UST:	2	Low:	0	Total Sites: 40
Total Sites:	40			

NPL

EXECUTIVE SUMMARY

Bangor Naval Submarine Base (NSB) is located on Hood Canal, which is ten miles north of Bremerton, Washington. Prior to its commissioning as a submarine base in 1977, the Navy facility at Bangor was primarily a transshipment and storage point for ordnance. Ordnance arrived by train and was shipped by boat to support the US military efforts in the Pacific Ocean during World War II and the Korean and Vietnam Wars.

As a storage facility, out-of-date and surplus ordnance was dismantled and steam cleaned, burned, or detonated on the base. The water from the steam cleaning demil operation, Site 204 (former Site F), drained into an unlined lagoon into the water table aquifer. The wastewater contained the ordnance compounds cyclonite (RDX) and trinitrotoluene (TNT) which washed through the ground and into the shallow aquifer. Over the years the RDX migrated with the flow of the groundwater. RDX is currently being detected approximately 3,000 feet northwest of the lagoon area. During this time, industrial wastes from supporting activities were also disposed of on base. These were common disposal practices from the 1940's through the early 1970's. Contaminants found include otto fuel residues, electroplating wastes, ammonium picrate, the ordnance compound DNT, the gasoline component benzene, the organic solvent DCA, the chemical additive PCB, pesticides and herbicides. The Navy has changed its operational processes to prevent further contamination. The Bangor Ordnance Disposal Area was placed on the National Priorities List (NPL) in 1987 due to concerns about ordnance-contaminated soil and groundwater, and the remainder of the base was placed on the NPL in 1990. On 29 January 1990, a Federal Facility Agreement (FFA) was signed by the Navy, EPA, and the State of Washington. Sites were grouped into eight Operable Units (OUs) for the Remedial Investigation and Feasibility Study (RI/FS) phase.

Drainage from Bangor NSB empties into Hood Canal and Dyes Inlet. Trident Lake is located south of Site 2 which has a high relative risk ranking. There are a series of aquifers underlying the submarine base. Contaminants have been found in a seasonal aquifer and the water table

aquifer. The base receives its water from a deeper aquifer layer; the sea level aquifer. No contaminants have been detected in the deeper aquifer. Residents living around the base obtain their drinking water from nearby wells.

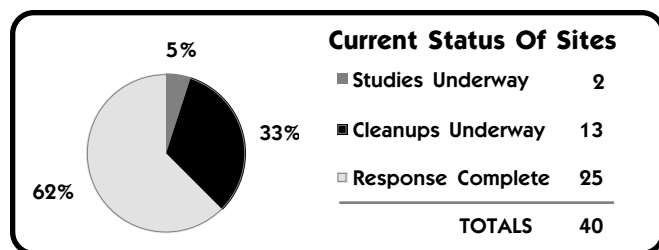
Community relations for NSB Bangor is an ongoing effort. The Community Relations Plan (CRP) was finalized in FY93. A local citizen's group obtained a grant from EPA and funds from the State of Washington Department of Ecology to oversee operations at NSB Bangor. A Restoration Advisory Board (RAB) was formed in FY95 and is expected to begin meeting in December 1995.

At the end of FY95, only two of the 40 sites at Bangor NSB were still in the study phase, 13 were in the cleanup phase and 25 were Response Complete (RC). Early removal actions include Underground Storage Tank (UST) removals in FY92 and FY94. Cleanup actions will continue for USTs 1 and 4 in FY96. The final removal action for UST 4 should begin in FY97.

In FY93, the excavation and disposal of buried drums was completed at OU 7 and a bermed area was reconstructed. A Record of Decision (ROD) is expected to be completed in FY96 for OU 7 and a Remedial Action (RA) for soils will also be completed. RA for groundwater will begin in FY97.

The Navy performed a precautionary measure in FY95 at OU 8 to protect human health. Volatile organic compounds (VOCs) above acceptable levels for drinking water were detected in a newly drilled community well. The well was never used by residents or certified by use by the health district. The Navy and health officials sampled nearby monitoring and residential wells. Since the compounds were only detected in the newly drilled well, the Navy drilled additional monitoring wells, found more VOC contamination, and then connected nearby residents to a public water supply. The Navy has drilled 24 additional monitoring wells to identify the extent of the compounds in the aquifer. Based on the information, the Navy will install a groundwater treatment system to contain the flow of chemicals from the base. Pump and Treat containment is on the fast-track and began in February of 1995. An enhanced system that uses an air-stripper within the treatment train to clean up the aquifer is expected to be operational in June of 1996.

An RA for soils will begin in December 1995 at OUs 2 and 6 using composting to degrade ordnance compounds (primarily TNT). An RA is expected to be completed in FY97. The estimated cost to compost the soils at both sites is less than half the cost of incineration. The treatment time is expected to be eight months for 1600 cubic yards of soil. Groundwater treatment design for OU 2 is expected to be completed in FY96.



BANGOR NSB RELEVANT ISSUES

ENVIRONMENTAL RISK



HYDROGEOLOGY - Drainage from Bangor NSB empties into Hood Canal and Dyes Inlet. Trident Lake is located south of Site 2 which has a high relative risk ranking. There are a series of aquifer beneath the submarine base. Contaminants have been found in a seasonal aquifer and the water table aquifer. The submarine base receives its water from a deeper aquifer layer; the sea level aquifer. No contaminants have been detected in the deeper aquifer.

One of the sites, Site 204 (Site F) is a former unlined lagoon that received wastewater from ordnance dismantling operations during the 1960's and 1970's. The wastewater also migrates into an overflow channel. Ordnance compounds were detected in the water table aquifer at Site 204. Off-base residents may receive water from this aquifer.

Residents living around the base obtain their drinking water from nearby wells. The Navy performed a response action in FY95 to connect a neighborhood near Bangor NSB with public drinking water. This is a precautionary measure to protect human health. Volatile organic compounds (VOCs) above drinking water levels were detected in a newly drilled community well. The well was never used by residents or certified by use by the health district. The Navy and health officials sampled nearby monitoring and residential wells. Since the compounds were only detected in the newly drilled well, the Navy drilled additional monitoring wells, found more VOC contamination, and hence connected nearby residents to a public water supply. The Navy has drilled 24 additional monitoring wells to identify the extent of the compounds in the aquifer. Based on the information, the Navy will install a groundwater treatment system to contain the flow of chemicals from the base. Pump and treat containment is on the fast-track and began in February of 1995. An enhanced system that uses an air-stripper in the treatment train to clean up the aquifer is expected to be operational in June of 1996.



NATURAL RESOURCES - NSB is in the second stage of reforestation. Most of the base is covered with Douglas Fir. Many other tree species are also present, such as western red cedar, grand fir, and western hemlock. There are chaparral areas and wetlands on the base. There are two boggy areas (swamps) at the northern boundary of Camp Wesley Harris, and another near the center of the property on the eastern boundary. Some areas on NSB support an abundance of species and are ecologically significant. Wilkes Marsh provides nesting areas for waterfowl. Duck hunting is allowed at NSB during a prescribed season. The marine waters along the NSB shoreline contain an abundant marine fauna including shellfish, salmon and herring. The warbled marrelot is the only endangered species at NSB Bangor.



RISK - Using the Department of Defense (DOD) Relative Risk Ranking System, fourteen sites received a high relative risk ranking at Bangor NSB. Site 2 which is contaminated with paint sludge, waste oil, and drums is very close to Trident Lakes, a recreational area. Site 201 is a 5-acre natural shoreline on Hood Canal which was used for dumping of solid and liquid wastes and landfilling. Groundwater and soil in this recreational area is contaminated. Sites 2 and 201 are part of OU 7. Remedial Design (RD) was completed for OU 7 in FY95. Cleanup proposed for soils is metal reclamation and Remedial Action (RA) will be completed in FY96. Site 28 was a former paint shop where paints and solvents were discharged into a waste ditch. Groundwater and private wells have been affected by these contaminants. A non-time critical removal action to stop VOC contamination migration from leaving the base will be implemented in FY96. A pump and treatment system will utilize an air stripper with a treatment train. Soils contaminated with lead can be found at Site 100, a pistol and handgun range.

Site 200 is a former explosive ordnance detonation and disposal area actively used from 1962-1975. Groundwater in this area is migrating towards an off-base residential area. Soil samples indicated the presence of TNT and dinitrotoluene (DNT) at levels that may be harmful to human

health. The Navy has finished construction on a passive-soil washing system at this site and full operations began in FY95. Cleanup is anticipated to take five years. The Navy selected Granular Activated Carbon (GAC) to remove organic chemicals from the water. Using GAC will save costs as opposed to the original method selected, which was ultraviolet light and oxidizers (UV/OX). The GAC acts as a water filter. Once the carbon becomes full, it is pumped into a rotary kiln where the contaminants are destroyed by the heat. The carbon is then reusable. The Navy originally planned to excavate soil from this hillside and perform the soil washing. During the cleanup design, it became clear that removing steep hillside soil would endanger a sensitive wetland area below the site. Excavation of the hillside posed a greater risk to the ecosystem than leaving the soil in place. Thom bushes were planted and signs prohibit access to the site. RA for soils is expected to be completed in FY97. Composting will be used to degrade the ordnance compounds TNT from the soils at Site 200.

Site 202 is a former ordnance burning ground. Surface water, soil, and a shallow aquifer are contaminated. The RD phase for soil composting at Site 202 will be completed in FY96. An RA will be completed in FY97.

REGULATORY ISSUES



NATIONAL PRIORITIES LIST - In 1987, Site 200 (former Site A) was placed on the National Priorities List (NPL) with a Hazard Ranking System (HRS) score of 30.42. On 30 August 1990, the rest of the base was listed on the NPL with a HRS score of 55.91 using information from the Initial Assessment Study (IAS). On 29 January 1990, the Department of the Navy (DON), EPA Region X, and the Washington State Department of Ecology signed a Federal Facility Agreement (FFA) for NSB Bangor. The EPA did not have sufficient information to delist any sites and requested additional studies at 22 sites. The FFA designated Sites B, 2, 4, 7, 10 and 18 for reentry into the Installation Restoration Program (IRP) process, added Site 26, identified Sites 27-30, and split Site C into Site 205 (East) and Site 206 (West). The FFA grouped the sites into the Operable Units (OUs) below. These OUs have been adjusted since the FFA was signed.

- OU 1 - Site 200 (Site A)
- OU 2 - Site 204 (Site F)
- OU 3 - Sites 16, 24 and 25
- OU 4 - Sites 205 (C-East) and Site 206 (C-West)
- OU 5 - Site 5
- OU 6 - Site 202 (Site D)
- OU 7 - Sites 201 (Site B), Site 203 (Site E), 2, 4, 7, 10, 11, 18, 26 and 30
- OU 8 - Sites 27-29



PARTNERING - Partnering sessions with the regulatory agencies expedited the cleanup of contaminated areas in FY94. The meetings streamlined the decision-making process by reducing the number of deliverables. Issues were resolved in person rather than through formal review comments, responses, and revisions.

COMMUNITY INVOLVEMENT



RESTORATION ADVISORY BOARD - The Technical Review Committee (TRC) was formed in FY87 and met on a regular basis. The TRC was converted to a Restoration Advisory Board (RAB) in FY95 and is expected to actively begin meeting in December 1995.



COMMUNITY RELATIONS PLAN - The Community Relations Plan (CRP) was finalized in 1993.



INFORMATION REPOSITORY - Information Repositories were established in 1990 and are located at NSB Bangor Branch Library in Silverdale, Washington and the Central Kitsap Library in Bremerton, Washington. A copy of the Administrative Record (the official file) is contained in the Information Repositories.

BANGOR NSB HISTORICAL PROGRESS

FY83

An Initial Assessment Study (IAS), equivalent to a Preliminary Assessment (PA) was completed and identified 37 potentially contaminated sites: 29 sites at NSB Bangor and eight sites at Jackson Park Housing. Jackson Park Housing has been transferred to Naval Shipyard (NSY) Puget Sound. **Sites A, C-F, 5, 6, 11, 12 and 19** - These sites were recommended for further investigation due to suspected contamination of groundwater and soil.

Sites B, 1-4, 7-10, 13-18 and 20-23 - These sites were recommended for No Further Action (NFA) due to a lack of significant contamination or to the natural degradation of contaminants.

UST 4 - Consisted of eight tanks at the Public Works Industrial Area. Three tanks were removed prior to FY83. Two tanks were abandoned in place.

FY88

Sites 24 and 25 - These two sites were identified and recommended for a Site Inspection (SI).

Site A - This site was proposed for listing on the National Priorities List (NPL) due to concerns about ordnance-contaminated soil and groundwater. A Current Situation Report (equivalent to an SI) found that surface soil was contaminated with the ordnance compound TNT, burn mounds were contaminated with the ordnance compound RDX, and groundwater samples contained TNT and RDX.

Sites A, C-F, 5, 6, 11 and 12 - These sites were recommended for an SI.

FY89

Sites C-F, 5, 6, 12, 24 and 25 - A Current Situation Report (equivalent to an SI) found otto fuel present at Site C, the ordnance compounds TNT and RDX present in the soil and shallow groundwater at Sites D and F, low levels of heavy metals (copper, silver and mercury) but no significant concentrations of waste constituents at Site E, fluorescein and cadmium present at Site 6, low contaminant concentrations in surface water and soil at Site 12, ordnance and metals contamination found in soil at Site 24, and elevated levels of copper, lead, RDX and picramic acid at Site 25. All sites except Site E were recommended to continue to the Remedial Investigation/Feasibility Study (RI/FS) phase.

Site 6 - Nonhazardous waste was removed using station funds.

UST 2 - This site consisted of 16 abandoned tanks that were discovered under the Installation Restoration Program (IRP). A PA was completed.

FY91

OU 1 - An RI/FS was completed.

OU 2 - An Interim Record of Decision (ROD) was signed in September 1991 to contain the contaminants migrating into groundwater.

FY92

OU 1 - A ROD was signed for groundwater.

UST 1 - An inlet pipe leak was repaired.

UST 2 - Tanks were removed.

UST 3 - Two tanks at the Keyport/Bangor Docks, were removed.

Site 16 and OU 7 - A Site Characterization Report (equivalent to an SI) was completed. Further study was recommended for Operable Unit (OU) 7.

FY93

OU 1 - The passive soil washing design was completed.

OU 2 - The RI/FS phase was completed.

OU 3 - The RI/FS phase was completed. A ROD was completed with "limited action" for groundwater monitoring at Site 25 and a Remedial Action (RA) consisting of land deed restrictions at Sites 16 and 24.

OU 4 - An RI/FS was completed. A Revision to the Final RI/FS changed the "limited action" preferred alternative to "no-action" and the ROD was signed.

OU 5 - An RI/FS was completed. A no-action ROD was completed.

OU 7 - A removal action was completed that involved the excavation and disposal of buried drums at three sites and the reconstruction of a bermed area at Site 2.

FY94

OU 1 - Changes were made to the FY92 ROD for groundwater. Granular Activated Carbon (GAC) has replaced passive soil washing as the treatment selected. There will be no excavation of soil on steep embankments as originally planned.

OU 2 - Changes were made to the FY91 ROD for groundwater. The treatment technology selected was GAC.

OU 6 - An RI/FS was completed at OU 6. The ROD was completed for OU 6 and the contaminated soil will be remediated using composting.

OU 7 - A ROD was signed in March. Cleanup proposed for soils is an infiltration barrier by asphalt/vegetated soils.

UST 2 - This site consisted of eight tanks and their tank lines. Six operational tanks were determined to have leaked and two tanks were removed.

PROGRESS DURING FISCAL YEAR 1995

FY95

OU 2 - An Interim Remedial Action (IRA) began in October 1994.

OU 7 - The RI/FS was completed in October 1994. The Remedial Design (RD) was completed. Cleanup proposed for soils at OU 7 is metal reclamation.

OU 8 (Sites 22-29) - This OU was created when volatile organic

compounds were found in the water table aquifer. The remedy included providing residential connections to the Silverdale Water District line. Pump and treat containment of groundwater containing possible volatile organic compounds is on the fast-track to avoid contamination of nearby residential wells. This action began in February.

PLANS FOR FISCAL YEARS 1996 AND 1997

FY96

Formal Restoration Advisory Board (RAB) meetings were started.

Sites 10 and 26 of OU 7 - Initiate Long Term Monitoring (LTM).

Sites 4, 7 and 30 of OU 7 - No action to be documented in the ROD.

OU 2 - An RD for groundwater is expected to be complete.

OU 6 - An RD will be completed for soil composting.

Sites 2, 201 (formerly Site B), 11 and 203 (formerly Site E) of OU 7 - The ROD is expected to be completed. An RA for soils will be completed late in FY96.

OU 8 - Implement a non-time critical removal action to stop volatile organic compound contamination migration from leaving the base. A pump and treatment system will utilize an air stripper in the treatment train. Anticipate operating by June 1996.

USTs 1 and 4 - An RA is expected to begin.

FY97

OU 2 - An RA for groundwater is expected to begin.

OUs 2 and 6 - An RA for soils is expected to be completed. Composting will be used to degrade ordnance compounds from the soils at Site 200 (formerly Site D) and Site 204 (formerly Site F). It will primarily be used to remove TNT. The treatment time is expected to be eight months for 1,600 cubic yards of soil.

Sites 11 and 203 of OU 7 - An RA will be underway for groundwater.

UST 1 - An RA is expected to be underway.

UST 4 - An RA is expected to be underway. Final removal action will begin.

BANGOR NSB PROGRESS AND PLANS

CERCLA	FY94 and before	FY95	FY96	FY97	FY98	FY99	FY00	FY01 and after
PA	30							
SI	24							
RI/FS	9	10	3					
RD		2	2			1		
RA	6			2		2	7	3
IRA	3(3)	3(3)				1(1)		4(4)
RC	24			1		2	7	4
Cumulative Response Complete	63%			66%		71%	89%	100%
UST	FY94 and before	FY95	FY96	FY97	FY98	FY99	FY00	FY01 and after
ISC								
INV		1	1					
CAP			1					
DES	1							
IMP		1					1	
IRA		1(1)						
RC		1					1	
Cumulative Response Complete		50%					100%	